WHAT IS CLAIMED IS:

1. A semiconductor device comprising:

a substrate;

an insulating film formed on the substrate, the insulating film comprising a substrate-side layer of an epitaxial crystalline insulating material and an electrode-side layer of an amorphous insulating material, the epitaxial crystalline insulating material containing metal, silicon and oxygen, and the amorphous insulating material containing metal, silicon, oxygen and nitrogen; and

an electrode formed on the insulating film.

2. The semiconductor device according to claim 1, wherein the nitrogen contained in the amorphous insulating material has a concentration of 15 atom% or more.

3. The semiconductor device according to claim 2, wherein the metal includes at least one element selected from the group consisting of Zr, Hf, Ti and lanthanoid elements.

4. The semiconductor device according to claim 2, wherein the substrate includes source/drain regions, the insulating film is a gate insulating film interposed between the source/drain regions, and the electrode is a gate electrode.

5. The semiconductor device according to claim 1, wherein the metal includes at least one element

selected from the group consisting of Zr, Hf, Ti and lanthanoid elements.

6. The semiconductor device according to claim 1, wherein the substrate includes source/drain regions, the insulating film is a gate insulating film interposed between the source/drain regions, and the electrode is a gate electrode.

7. A method of manufacturing a semiconductor device comprising:

forming an amorphous insulating layer containing metal, silicon and oxygen on a substrate, the amorphous insulating layer further containing nitrogen in a surface region thereof; and

heat-treating the amorphous insulating layer in a non-oxidizing atmosphere, permitting a solid-phase growth to take place in a region containing no nitrogen while remaining the nitrogen-containing surface region as an amorphous insulating layer, thereby forming an epitaxial crystalline insulating layer containing a metal, silicon and oxygen on the substrate side of the amorphous insulating layer.

8. The method of manufacturing a semiconductor device according to claim 7, wherein the nitrogen is contained in the surface region of the amorphous insulating layer at a concentration of 15 atom% or more.

9. The method of manufacturing a semiconductor

device according to claim 7, wherein the metal includes at least one element selected from the group consisting of Zr, Hf, Ti and lanthanoid elements.

10. The method of manufacturing a semiconductor device according to claim 7, wherein the surface region containing nitrogen has a thickness ranging from 1 nm to 2.5 nm.

11. The method of manufacturing a semiconductor device according to claim 7, wherein the amorphous insulating layer containing nitrogen in the surface region thereof is formed by depositing a metal silicate film on the substrate and exposing the metal silicate film to exited nitrogen.

12. The method of manufacturing a semiconductor device according to claim 11, wherein the metal silicate film has a thickness of 10 nm or less.

13. The method of manufacturing a semiconductor device according to claim 7, wherein the amorphous insulating layer containing nitrogen in the surface region thereof is formed by depositing a metal silicate on the substrate in a nitrogen atmosphere.

14. The method of manufacturing a semiconductor device according to claim 13, wherein the metal silicate film has a thickness of 10 nm or less.

15. The method of manufacturing a semiconductor device according to claim 7, wherein the non-oxidizing atmosphere is an atmosphere containing oxygen at a

partial pressure of 1×10^{-3} Torr or less.

16. The method of manufacturing a semiconductor device according to claim 7, further comprising forming an electrode on the amorphous insulating film successively forming the amorphous insulating film.

17. The method of manufacturing a semiconductor device according to claim 7, wherein the heat treatment is performed at a temperature ranging from 950°C to 1200°C.

18. A method of manufacturing a semiconductor device comprising:

forming an amorphous insulating layer containing metal, silicon and oxygen on a substrate, the amorphous insulating layer comprising a surface region and a substrate side remnant region, the surface region further containing a nitrogen of a first concentration, and the remnant region containing a nitrogen of a second concentration less than the first concentration; and

heat-treating the amorphous insulating layer in a non-oxidizing atmosphere, permitting a solid-phase growth to take place in the substrate remnant region while having the first region as an amorphous insulating layer.

19. The method of manufacturing a semiconductor device according to claim 18, wherein the non-oxidizing atmosphere comprises a partial oxygen pressure of

1×10^{-3} Torr or less.

20. The method of manufacturing a semiconductor device according to claim 18, wherein the non-oxidizing atmosphere is formed by depositing a conductive film on the amorphous insulating prior to the step of heat-treating.

21. The method of manufacturing a semiconductor device according to claim 18, wherein the metal includes at least one element selected from the group consisting of Zr, Hf, Ti and lanthanoid elements.